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The Effect of the Household Balance Sheet on Unemployment – Evidence from Spanish Provinces

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The Effect of the Household Balance Sheet on Unemployment – Evidence from Spanish Provinces

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ABSTRACT

This paper takes a close look at one of the possible causes of Spain's severe crisis and studies the extent to which the increase in Spanish unemployment is due to the effects of household balance sheet effects. By estimating proxies for housing net worth shocks as well as household sector debt to disposable income ratios for 52 Spanish provinces together with detailed data on sectoral provincial unemployment data, we find that household balance sheet effects contribute a significant portion to the increase in unemployment between 2008 and 2010. Our outcomes confirm the results for the US from Mian and Sufi (2014). In contrast, for the time period between 2007 and 2014, we do not find any explanation power. Mostly interesting, we find contrary results for the episode between 2010 and 2014: Provinces, which cut back demand between 2007 and 2010 significantly strongly, did so significantly less than other provinces subsequently.

JEL Classification: G01, J23, E21

Keywords: debt; leverage; demand; balance sheet recession; household sector; unemployment; house prices

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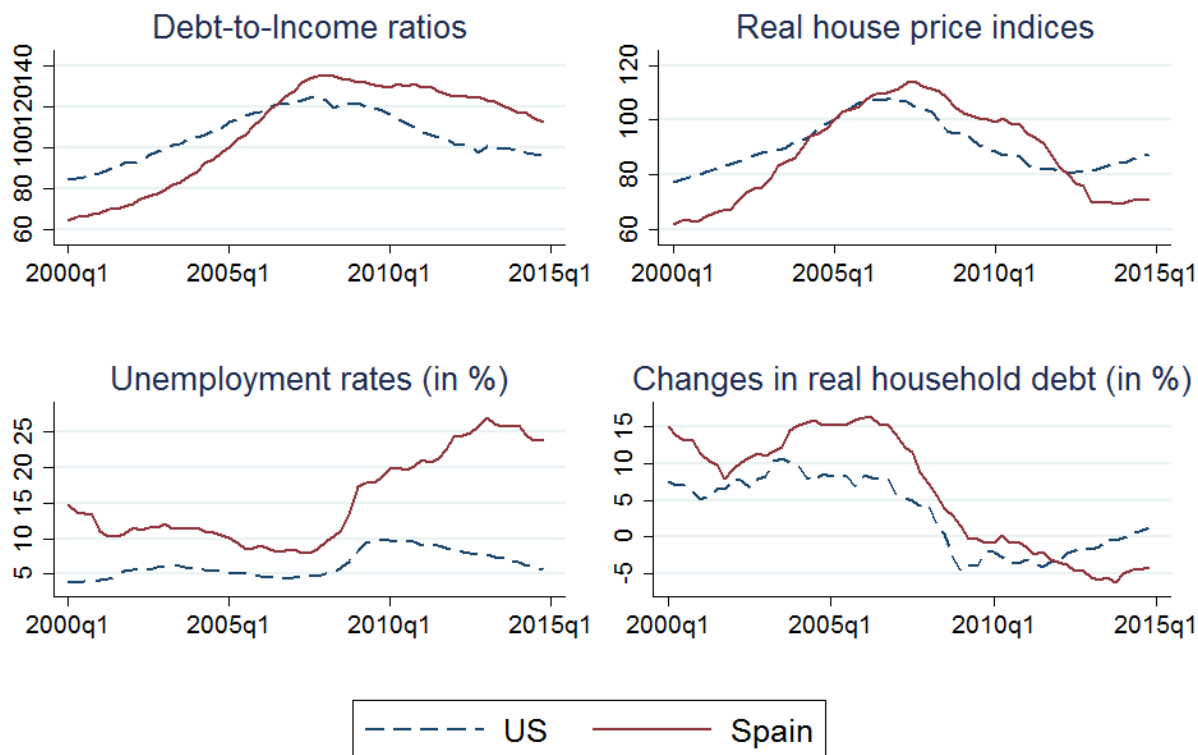
1 INTRODUCTION

Spanish unemployment has risen from a low of 7% in 2007 to its height of 26% in 2013. Unemployment rates are particularly high for young people with every second young Spaniard looking for a job. Given the enormous economic, psychological and social problems that are related with high and long-lasting unemployment, it is of the utmost importance to study the causes of the high increase in Spanish unemployment.

In this paper we therefore take a close look at one of the possible causes and study the extent to which the increase in Spanish unemployment is due to the effects of Spanish balance sheet effects. Using proxies for housing net worth shocks as well as household sector debt to disposable income ratios for 52 Spanish provinces together with detailed data on sectoral provincial unemployment data we show that our proxies for household demand explain significantly a portion of the increase in unemployment between 2007 and 2010. These results are closely in line with the results from Mian and Sufi (2014). In contrast, between 2007 and 2014, we do not find any explanation power. Even more interesting, we find contrary results for the episode between 2010 and 2014, which means that provinces, which cut back demand between 2007 and 2010 significantly strongly, did so significantly less than other provinces subsequently. These results allow us to draw the conclusion that household demand effects and house price effects on the household balance sheet have explanatory power for the beginning of Spain's crisis but do not explain the long lasting downturn.

From a research perspective, Spain is one of the most interesting countries to analyse due to the fact that the economy suffered from a similar economic environment as the United States, but duration as well as amplitudes of important macroeconomic variables exceeded the aggregates of the US by far.

Figure 1: The macroeconomic environment in Spain and the US



Source: FRED, ECB, Eurostat

The unemployment rate in the US increased sharply between 2006 and 2009 and decreased steadily afterwards. According to Brunnermeier and Schnabl (2015), US' subprime housing bubble peaked in 2007 and its crisis ended in 2010. Spain suffered from a similar increase in the unemployment rate between 2006 and 2009 but in contrast to the US, Spain's unemployment rates stagnated in 2010 and increased thenceforward until the beginning of 2014. Debt-to-income, real house prices as well as the real household debt moved together with the unemployment rate, showing a plateau in 2010 and exacerbated afterwards. Spain faced the peak of the Spanish housing bubble like the US in 2007 but in contrast to the US, crisis has not ended before 2015 (Brunnermeier and Schnabl 2015). Having a closer look at Spain's economy, one could argue differently: Spain experienced like the US the financial crisis, which ended in the beginning of 2010 and afterwards, the sovereign debt crisis in the euro area hits in and worsens the economic

condition in Spain. Arguing solely from a national macroeconomic perspective, the plateaus in 2010 could be interpreted as a break between two different crises, but also as a pause, whereby afterwards the same crisis accelerated again.

The underlying transmission mechanism investigated in this study begins with a deleveraging shock to the balance sheets of individual households. The shock for households is greater if they must direct more effort to restructure their balance sheets. The more debt a household has accumulated relative to its income before the shock occurred, the more deleveraging the household must arrange by increasing savings and reducing spending after the shock to restructure its balance sheet. Given the elasticity of employment with respect to demand, these deleveraging needs will increase unemployment.

This paper contributes to the academic and public debate regarding the relationship between household debt, aggregate demand and its effect on unemployment by studying Spanish provincial household debt and sectoral employment data. Following Mian and Sufi (2014) we take advantage of the fact that changes in *non-tradable* employment is driven by local demand which in turn depends largely on changes in local households' financial situations. Spanish households' financial situations are currently mainly determined by their deleveraging needs. Thus, by calculating the increased unemployment, in the non-tradable sectors of Spanish provinces and regressing those changes on provincial household debt to income levels and housing net worth shocks, we can identify the increase in unemployment that is solely related to household debt-driven aggregate demand shocks.

The remainder of the paper is structured as follows. Section 2 provides a brief overview of the related literature. Section 3 describes the theoretical framework. Section 4 presents the empirical evidence for Spanish provinces.. Section 5 concludes the paper.

2 OVERVIEW OF RELATED LITERATURE

The effect of household debt on the economy has been repeatedly examined in combination with recessions. Fisher (1933) postulated the debt-deflation theory of great depressions. Mishkin (1978) empirically examined the Great Depression and considered how household balance sheets served as a transmission mechanism for changes in aggregate demand. The American recession of 1973-75 is empirically investigated by Mishkin, Gordon and Hymans (1977), who focus on the role of household debt and stock market developments. All of these papers find an important negative effect of debt on economic activity. However, whereas Fisher (1933) examines the effect on asset prices, Mishkin (1978) and Mishkin et al. (1977) focus on consumption and aggregate demand. Palley (1994) builds a model of the effects of household debt on aggregate demand based on the different propensities to consume among creditor and debtor households and applies the model to the recession of the early nineties. Palley (1994) concludes that increases in household debt fuel aggregate demand but that the servicing of this debt subsequently lowers aggregate demand. The financial crisis and economic downturn of 2007-09 have again drawn attention to the role of household sector debt. Keen (2009) emphasizes the role of debt for aggregate demand. Changes in the volume of debt as a percentage of GDP explain how much of the aggregate demand is debt financed. Keen (2009) validates the link between the household debt and aggregate demand for Australia by showing how both increasing debt and declining unemployment and decreasing debt and rising unemployment move together. The link between housing net worth shocks and unemployment in the recent recession is shown for the United States in Mian and Sufi (2014) and Dynan (2012). Dynan (2012) uses the Panel Study of Income Dynamics (PSID) to examine the effect of household debt on consumption. She estimates the effect of leverage and that of debt service burdens on the changes in consumption

that occurred from 2007 to 2009 and confirms that a significant negative impact exists even after income and wealth effects are controlled for. This approach provides a microfoundation for the deleveraging shock that depresses consumption in addition to wealth and income effects.

Mian, Rao and Sufi (2012) use local retail sales data to show that household debt levels affect consumption. Having illustrated the link between household debt and consumption, Mian, Rao and Sufi (2012) use the elasticity of employment to aggregate demand to measure the transmission of household debt via consumption and aggregate demand on employment and thus, to the severity of the crisis in the United States. The distinction between employment in the tradable and non-tradable sectors is important to the analysis. The demand for tradable goods is determined on a national or international level, which renders the shocks to the household balance sheet in one county unimportant. The demand for non-tradable goods, in contrast, depends only on local consumption. Thus, regional employment in tradable industries should be independent of local debt levels, whilst employment in non-tradable industries should instead be highly dependent on local debt levels.

The International Monetary Fund (2012) and the McKinsey Global Institute (2010, 2012) reports cover more than one country. The IMF finds that larger increases in household debt lead to more severe recessions and examines country-level case studies in seeking to determine how to address large household debts and house price decreases. The McKinsey Global Institute examines deleveraging across all economic sectors and describes how historic deleveraging processes have taken place (cf. McKinsey Global Institute (2010)) and how the major economies have meanwhile progressed in their deleveraging process (cf. McKinsey Global Institute (2012)). The case studies presented in that report suggest that during an economy-wide deleveraging, a country should begin with deleveraging in the private sector while the public sector compensates

for the loss in aggregate demand; then, the latter should begin deleveraging once the nation's economic growth regains its momentum.

3 THEORETICAL FRAMEWORK

The transmission mechanism of household debt to aggregate demand is as described by Keen (2009), Mian and Sufi (2012) or Dynan (2012). Using the permanent income hypothesis (PIH) or life cycle hypothesis (LCH), the households that expect higher future income (PIH) or that benefit from increased housing wealth (LCH) should adapt their consumption behavior and consume more. If the household's expectations regarding future income are sufficiently high, the household can rationally take on debt today to smooth consumption. When a negative exogenous shock lowers the expectations of the household, the household will need to change its consumption and investment behavior accordingly. Households that have increased their debt more than others or that hold higher debt levels must reduce their debt by a larger amount. The household balance sheet is restructured through reductions in consumption spending. Still, it is not unquestionable that the aggregate demand is affected by the households that restructure their balance sheets. Households that have acted as lenders in the first place will have the option to consume more when the debt is repaid. Thus, in aggregate, there should be no effect on aggregate demand if the propensity to consume out of income is the same across households. Nevertheless, the aggregate demand might indeed be reduced if the debt overhang is sufficiently large and if the economy is stuck at the zero lower bound (cf. Eggertsson and Krugman (2012)).

The American subprime crisis of 2007 spread to the European and Spanish real economy in 2008. There was a peak in Spanish debt issuance in 2007 and a peak in Spanish employment in

2008. Thus, 2007 serves as a starting point for our analysis of the effects of household debt on aggregate demand. We argue that debt levels have an effect on consumption and, consequently, on aggregate demand. The transmission channel is the necessary restructuring of the household balance sheet. In a boom period, a household takes on debt, anticipating increases in future income and asset prices. The household spends this debt on the purchase of assets, the most important of which is housing, and on consumption expenditure. When the boom period ends, asset prices stagnate or shrink, and future income streams become more uncertain. Households consequently restructure their balance sheets in accordance with their updated expectations. The restructuring of balance sheets comes along with increasing saving and decreasing consumption expenditure. The higher the debt level of the household sector, the larger the amount of debt that the sector must repay and the greater the reduction in consumption and, thus, aggregate demand. The level of debt is a good indicator because there is a natural limit to household debt in terms of debt service. The more debt a household sector holds, the larger the debt service burden, and this burden cannot exceed disposable income if one rules out Ponzi games. If interest rates do not change, an increase in the debt-to-income ratio will alter the debt service burden proportionally. If the aggregated household sector long-term consumption behavior does not change accordingly, a short-term drop in consumption must occur to soften the process of adjustment to the previous debt-to-income ratios. This drop in consumption will dampen the aggregate demand and, consequently, will decrease employment. For there to be an effect on aggregate demand, it is not even necessary for there to be a nominal decrease in debt volume. A reduction in the debt growth rate is sufficient to reduce the aggregate demand relative to previous periods when the income levels do not change because the total amount that is available for consumption is reduced.

The theoretical foundation for the investigation of the effect of household debt via the aggregate demand channel on unemployment is provided in Mian and Sufi (2012). To make our presentation self-contained we next lay out a short version of the model by Mian and Sufi. Differences arise because we look at increases in unemployment at a provincial level ΔU_p and the elasticity of unemployment to a reduction in consumption and aggregate demand η instead of employment losses at a county level Y_c and the elasticity of employment with respect to output demand β .

The model setup is as follows: households spend a fraction α of their income on non-tradable goods NT and the rest of their income $1 - \alpha$ on tradable goods T. When households reduce their consumption, both, tradable and non-tradable goods are affected. Unemployment reacts to this reduction in demand and increases according to the elasticity of unemployment to a reduction in aggregate demand η .

In this model, province p is hit by the demand shock δ_p . However, the total shock to a province γ_p consists of a reduction in demand for non-tradable goods in the respective province and a reduction in demand for tradable goods from the whole country that hits this province:

$$(1) \quad \gamma_p = \alpha \delta_p + (1 - \alpha) \bar{\delta}$$

where $\bar{\delta}$ is the average shock for tradable goods for each province:

$$(2) \quad \bar{\delta} = \frac{1}{N} \sum_{p=1}^N \delta_p$$

The total demand-driven increase in unemployment in province p depends on the elasticity of unemployment with respect to output, i.e. $\eta \gamma_p$. Each province is furthermore exposed

to a country wide shock ε that is equal to all provinces and a structural shock s_p that just affects province p . The total increase in unemployment ΔU_p in a province can thus be written as:

$$(3) \quad \Delta U_p = \eta\alpha\delta_p + \eta(1 - \alpha)\bar{\delta} + \varepsilon + s_p$$

The aggregate increase in unemployment that results from the debt-driven demand shock only (6) can then be calculated as the sum of the increases in unemployment in non-tradable sectors (4) and the sum of the increases in unemployment in tradable sectors (5).

$$(4) \quad \sum_{p=1}^N \eta\alpha\delta_p = N\eta\alpha\bar{\delta}$$

$$(5) \quad \sum_{p=1}^N \eta(1 - \alpha)\bar{\delta} = N\eta(1 - \alpha)\bar{\delta}$$

$$(6) \quad N\eta(1 - \alpha)\bar{\delta} + N\eta\alpha\bar{\delta} = N\eta\bar{\delta}$$

To derive econometrically the effect of this demand shock, the structural shock in province p and the country wide shock that affects all provinces equally need to be excluded. By using a narrow definition for the non-tradable sector that focuses on regional consumption that is not likely to be prone to a regional structural shock, we aim to exclude s_p from our calculation. The change in non-tradable sector unemployment for a province that is not exposed to a regional structural unemployment shock is given by equation (7):

$$(7) \quad \Delta U_p^{NT} = \eta\alpha\delta_p + \alpha\varepsilon$$

4 EMPIRICAL EVIDENCE

Our main object is to identify household balance sheet effects on unemployment. Our identification strategy is hereby based on our theoretical framework as well as on the theoretical framework provided by Mian and Sufi (2014). While crisis dates in the US are easy to determine, the crisis in Spain started in 2007 and has not ended until the end of 2014. Additionally, Spain passed through different stages during that time so that it is not obvious, whether Spain suffered from one big crisis (a Spanish housing bubble) or from two different ones, namely the financial crisis and the sovereign debt crisis in the euro area.

4.1 Description of the data

We consider two different measurements, which have the ability to affect household demand. Firstly, we use household debt to disposable income, which is able to identify necessary adjustments on the liability side of household balance sheets. Secondly, we make use of housing net worth shocks, which capture changes in house prices which deteriorates the asset side of households subject to their previous net worth.

Unfortunately, for both measurements data is not available in a direct way. For the first measurement, we need the aggregated household debt on a provincial basis, which is not directly available and is therefore estimated as follows: Mortgage debt contributes by far the most part of Spanish household debt. According to the survey of household finances (EFF) ¹ in Spain, mortgage debt accounted for 84.2% of total mortgage debt in 2008 and for 86.9% in 2011. In addition, this share is almost independent of different income percentiles. Mortgage data is

¹ The ratio of 2008 mortgage debt to total debt ranges from a maximum of 85.3% for the top income percentile to a minimum of 82.3% for the second highest income percentile. The overall average is 84%. The differences in the income percentiles can be traced to the fact that the highest income percentile uses less than half of its mortgages for main residences, whereas the poorest 40% of households use 87% of their mortgages for main residences (cf. Bank of Spain (2011), p. 111 Table 6).

monthly available at the Spanish Statistical Office (INE) from 1995 onwards on a provincial basis. In detail, we make use of the newly issued mortgages for dwellings.

The volume of mortgages at a certain point in time can be approximated by the aggregated volume of newly issued housing mortgages in the five years preceding the crisis, i.e., from January 2003 until December 2007.² The household mortgage debt calculated in this indirect way is 85.3% of the total household liabilities in Spain at the end of 2007 (total liabilities are documented by the Bank of Spain). This is a very close estimate according to the number of 84.1% published by the Bank of Spain (2011, p. 111). The main reason why we underestimate the total household debt level is that our measure does not include credit card debt or personal loans. Our measure is therefore a valid approximation if we assume that there are no systematic differences in the structure of other liabilities than mortgages across provinces.

We construct our first indicator debt-to-income by dividing our household debt measurement by provincial disposable income, whereby provincial disposable income data is taken from the household income distribution accounts from INE.

Our second measurement is based on Mian and Sufi (2014). The housing net worth shock does not only take the liability side but also the asset side into account. Taken from Mian and Sufi (2014), we define net worth for households living in province i at time t as

$NW_t^i = S_t^i + B_t^i + H_t^i - D_t^i$, where S represents the value of stocks, B the value of bonds, H the value of housing and D the household debt. The housing net worth shock is finally defined as

² Mian and Sufi (2012, p. 12 and 13) use the debt-to-income ratio in their analysis but state that using the accumulation of household debt in the five years preceding the crisis as an alternative measure would not change the results of their analysis.

$\Delta HNW = \frac{\Delta \log p_{x-t}^{H,i} * H_x^i}{NW_x^i}$, where x is the starting period of the shock and t is the endpoint,

$\Delta \log p_{x-t}^{H,i}$ is the change in the house price and H is the stock of housing.

In contrast to Mian and Sufi (2014), our data is not based on an individual level. Nevertheless, we are able to break down our data to the mean household living in province i . The denominator in our case is therefore the percentage change in house price times the value of the house before the crisis. Relevant data is provided by the Spanish Ministry of Public Works and Transport. All prices are mean prices of residential real estate transactions by province and quarter and are available from 2006 onwards. For the nominator we neglect from the value of stocks and bonds on the asset side and on the liability side we neglect from other debt as mortgage debt, assuming again that there are no structural differences among these variables between different provinces. Hereby we want to emphasize that our estimate is able to capture around 85% on the asset as well as on the liability side. As the housing net worth shock is estimated on an individual level, we cannot take our estimation for household debt from our previous indicator. We therefore construct the net worth as follows: In addition to the total *amount* of newly issued mortgages for dwellings, INE provides the *numbers* of newly issued mortgages on a monthly basis. To construct D_t^i we divide the amount of mortgages by the number of mortgages for every month. This gives us the average volume of a single mortgage at a certain month for a certain province. Taking a 7 year average of this estimate should provide a valid proxy for the average volume of a mortgage on a provincial basis. Finally, subtracting this estimate by the house price gives us the net worth at a certain point in time.

Our dependent variable is unemployment in the non-trade sector on a provincial basis whereby our strategy is taken from Mian and Sufi (2014). To determine the household demand

effects, it is necessary to identify the portion of unemployment that results from consumption in the individual provinces. To identify this effect, the unemployment data by economic activity on a provincial level are obtained from the Spanish Ministry of Employment and Social Security (SEPE).

In contrast to Mian and Sufi (2014), we use unemployment data instead of employment data. Unemployment data for Spanish provinces is not available on a fine grained definition. Therefore, we use unemployment data. Data is available from the employment statistic from the ministry of Employment and Social Security (SEPE). In detail, we make use of the number of job seekers, who are split up into 22 different groups on a monthly basis from 2006 until 2014. These groups are then clustered by the type of economic activity into the tradable sector, the non-tradable sector, construction or other sectors. Due to a change in the classification system for economic activities that occurred in 2009, we need to match the earlier classification system with the recoded one. Consequently, not all of the groups are exactly matched, but the tradable and non-tradable sectors can be identified.

Due to the fact that the demand for tradable economic activities is not bound to the place of production but to the entire economy the tradable sector faces similar shocks across all provinces. The economic activities that we classify as tradable are the extracting industries, the manufacturing industries, agriculture and fishing. All of the goods produced in these industries can generally be shipped to other provinces within Spain or even outside Spain. It is obvious, that a less granular distinction would lead to even fewer inaccuracies between these sectors. However, unemployment data for the subgroups 22 groups are only available at the aggregate national level. Ideally, we would distinguish between manufacturing industries that produce for the entire Spanish market, such as the automobile industry, and manufacturing industries that only produce

for local markets. Because some of the employment in the manufacturing sector is linked to the local markets, we expect to see a correlation between local spending and manufacturing. An even stricter distinction would eliminate any correlation between manufacturing, i.e., tradable goods, employment effects and household sector debt. Thus, the outcome of this exercise should be seen as rather conservative estimate for the tradable sector. If we could draw a more exact line within the manufacturing sector, the results would be even stronger.

The non-tradable industries produce goods that are linked to local consumption spending, as indicated by the 1993 definition “trade, repair of motor vehicles, motorcycles, household goods and personal items” and “private households with employed persons”. (Retail) Trade activities like those conducted by grocery stores or clothing and shoe stores crucially depend on local consumption. The same is true of the personnel employed in household services.

It is not necessarily true that the non-tradable sectors experience higher increases in unemployment than the tradable sectors because the employment elasticities with regards to consumption may be different and consumption on durables may be more affected. However, it is important to note that the non-tradable sector depends on aggregate demand on the *provincial* level, and the hypothesis to be tested builds on this link. Finalizing the idea, we expect significant results for the non-tradable sector, while for the tradable sector estimates should have no effect.

As there are several issues, which could bias our results we consider a couple of additional variable to improve our outcomes. There are two possible reasons for changes in the unemployment rate which should be excluded from our analysis. Firstly, unemployed persons from provinces with bad job perspectives could move to other provinces. We therefore measure the percentage change in the size of the workforce, whereby the workforce is defined as individuals between the ages of 15 and 64. This variable is available from Eurostat on a yearly

basis from 2000 until 2014. Secondly, unemployed persons could give up seeking for jobs and become inactive. Therefore, the percentage change in the number of active persons controls for drop outs of the labor market. This variable is available from INE on a quarterly basis from 2008 until 2014.

As already explained, our debt variables are based on mortgages. If a new mortgage is issued, the house of the mortgage determines the location. This leads to the problem that, especially for possible second house mortgages, the holder of the mortgage will not live in the province, where the house is located. To capture this issue, we make use of the number of property transactions by residents according to province, which is available from the ministry of development on a quarterly basis from 2006 until 2014. From the provided cross-tabulation, we construct the share of transaction taken in the same province over the total transactions for every province. Estimating a 2-year average of this share controls our debt variable in an appropriate way for this data problem.

Another issue which could lead to biased results is tourism. It might be the case that a reduction in tourism due to economic downturns in other provinces and/or countries drives results in provinces which are more dependent on tourism. This is especially important as our dependent variable non-trade unemployment captures for instance employment in restaurants, which may in some provinces highly driven by tourism. To control for this issue, we estimate the percentage change in tourism. Therefore we make use of the total number of nights spent by residents, which is available from Eurostat on a yearly basis from 2000 until 2014. Unfortunately, tourism data is only available on a community level. Therefore, we use this data from a certain community for every province within this state.

As Spain has borders to France and Portugal, we control for possible spillovers by creating a dummy for provinces with borders to France and a second dummy for provinces with borders to Portugal.

4.2 Empirical analysis

The literature reviewed in Section 2 examines mainly the effect of deleveraging on the economy. As one can see in figure 1, the Spanish household sector as a whole has slightly reduced its debt outstanding relative to GDP and disposable income. However, for us to investigate the household balance sheet effect, the households do not necessarily need to have reduced their nominal debt outstanding. It is sufficient that they exhibit reduced growth in liabilities and consume less than in previous periods. The case of Spain is a good example of the mechanism in question: on average, from the beginning of 2003 to the end of 2007, the liabilities of Spanish households increased by approximately 6 percent of GDP per year. In the period from the beginning of 2008 to the end of 2010, household sector debt increased on average by 1 percent of GDP. Under the two simplifying assumptions that households spend all of their income and the net incurrence of liabilities on consumption and investment and that their income share as well as total GDP remained approximately constant from 2007 to 2010, a reduction in the debt growth from 6 percent of GDP to 1 percent of GDP means a reduction in spending of 5 percent of GDP without deleveraging. An increase in the debt outstanding can thus still go in hand with a reduction in consumption expenditure. Therefore, an analysis of the debt-consumption link should not exclusively examine nominal deleveraging.

We start our analysis by evaluating the first part of the crisis, namely from 2007 until 2010. Although our data set is constructed on a quarterly basis, we estimate yearly averages for every variable to avoid the possible interpretation that our results are only valid for a certain

quarter. The provinces Ceuta and Melilla are not considered in our estimation due to explicitly expressed concerns by the Spanish Statistical Office. Nevertheless, they would not change our results. Average house purchases are considered in every regression for debt-to-income ratios to make the results more promising. Nevertheless, omitting this variable would not change any results.

Table 1: Summary Statistics (2010)

	N	mean	median	SD	10th	90th
Non-tradable unemployment growth, 2008 to 2010	50	0.421	0.4	0.117	0.283	0.614
Non-tradable unemployment growth, 2007 to 2010	50	0.556	0.527	0.169	0.347	0.812
Tradable unemployment growth, 2008 to 2010	50	0.419	0.426	0.203	0.145	0.685
Tradable unemployment growth, 2007 to 2010	50	0.573	0.551	0.267	0.223	0.896
Housing net worth shock, 2008 to 2010	50	-0.156	-0.171	0.27	-0.496	0.213
Housing net worth shock, 2007 to 2010	50	-0.045	-0.087	0.292	-0.402	0.3
Household debt-to-income ratio, 2007	50	0.899	0.788	0.404	0.484	1.48
Household debt-to-GDP ratio, 2007	50	0.594	0.536	0.247	0.344	0.936
Household debt-to-GDP ratio, 2002	50	0.325	0.318	0.109	0.2	0.511
Average house purchase fraction, 2006 to 2008	50	0.813	0.829	0.115	0.597	0.949
House price growth, 2008 to 2010	50	-0.051	-0.048	0.068	-0.126	0.048
House price growth, 2007 to 2010	50	-0.027	-0.03	0.084	-0.141	0.068
House price transactions growth, 2008 to 2010	50	-0.183	-0.191	0.177	-0.416	0.086
Active person growth, 2008 to 2010	50	0.006	0.007	0.026	-0.027	0.041
Labor force growth, 2008 to 2010	50	0.026	0.025	0.025	-0.004	0.053
Tourism growth, 2008 to 2010	50	-0.009	-0.001	0.056	-0.061	0.061
GDP fraction of construction sector, 2008	50	0.111	0.111	0.02	0.081	0.141

Table 2: Effects of debt-to-income ratios in 2007 on unemployment growth between 2008 and 2010^a

	Unemployment growth, 2008-2010									
	Non-Tradable Sector					Tradable Sector				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Household debt-to-income ratio, 2007	0.17*** [0.04]	0.16*** [0.04]	0.10*** [0.04]	0.09* [0.04]	0.07** [0.03]	0.10** [0.05]	0.14*** [0.04]	0.16*** [0.04]	0.48** [0.23]	0.09 [0.08]
Average house purchase fraction, 2006 to 2008		-0.12 [0.10]	0.05 [0.12]	-0.1 [0.10]	-0.17** [0.09]	-0.20* [0.11]	-0.12 [0.10]	-0.15 [0.14]	-0.2 [0.12]	-0.49* [0.25]
Active person growth, 2008 to 2010		-1.85*** [0.45]								-2.65** [1.02]
Labor force growth, 2008 to 2010		2.59*** [0.58]								5.56*** [1.24]
House price growth, 2008 to 2010				-0.71*** [0.21]		-0.70*** [0.22]				-1.27*** [0.36]
House price growth, 2007 to 2010					-0.77*** [0.18]					-1.42*** [0.43]
House price transactions growth, 2008 to 2010					0.14 [0.09]					0.27 [0.17]
Border to Portugal							-0.10*** [0.03]			-0.11* [0.06]
Border to France							0.03 [0.05]			0.09** [0.04]
Tourism growth, 2008 to 2010							0.2 [0.35]			-0.04 [0.54]
Debt-to-Income times									-2.61 [1.84]	-3.33 [3.40]
Construction sector									-1.12 [2.05]	0.36 [3.79]
GDP fraction of construction sector, 2008										
N	50	50	50	50	50	50	50	50	50	50
R ²	0.32	0.34	0.59	0.44	0.54	0.47	0.43	0.34	0.4	0.04
									0.11	0.35
									0.22	0.26
									0.17	0.11
									0.18	0.18

^aThe regressions are estimated using ordinary least squares. Heteroskedasticity-robust standard errors are in brackets.

***, **, * Coefficient statistically different than zero at 1%, 5% and 10% confidence level, respectively.

Table 2 shows the effects of debt-to-income ratios in 2007 on non-tradable and tradable sector unemployment growth. Results show clearly that there is a positive effect between debt-to-income ratios and non-tradable sector unemployment growth. This means that a high debt-to-income ratio in 2007 leads to a high unemployment growth from 2008 to 2010. Even if we control for changes in house prices (regressions 4-6), a significant positive effect remains. This clearly shows that there are liability side effects of the balance sheet. Controlling for the construction sector does not change our results as well. As expected, of debt-to-income ratios in 2007 are solely insignificant for the tradable sector unemployment growth.

[The discussion of this subsection will be extended in a forthcoming working paper.]

Table 3: Effects of Housing net worth shocks on unemployment growth^a

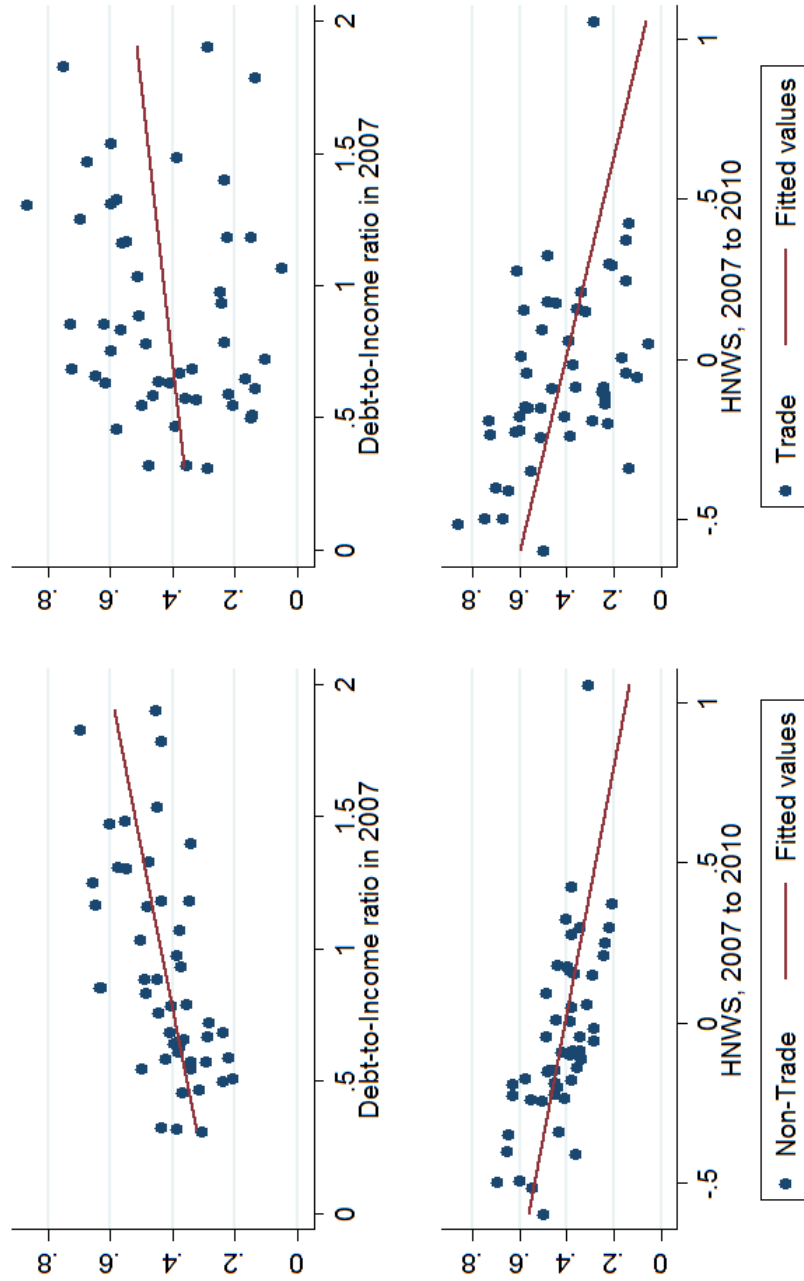
	Unemployment growth, 2008-2010													
	Non-Tradable Sector			Tradable Sector										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Housing net worth shock, 2007 to 2010	-0.26*** [0.06]	-0.15*** [0.05]	-0.23*** [0.06]	-0.26*** [0.06]	-0.55** [0.24]	-0.35** [0.14]	-0.17*** [0.05]	-0.32*** [0.09]	-0.17** [0.09]	-0.30*** [0.10]	-0.33*** [0.10]	-0.6 [0.39]	-0.32 [0.48]	-0.03 [0.10]
Active person growth, 2008 to 2010		-1.36*** [0.39]							-2.81*** [0.95]					
Labor force growth, 2008 to 2010		2.56*** [0.40]							3.71*** [0.83]					
Border to Portugal			-0.06* [0.03]							-0.03 [0.06]				
Border to France			0.01 [0.04]							0.09 [0.05]				
Tourism growth, 2008 to 2010				-0.06 [0.24]							-0.53 [0.35]			
HNWS times GDP fraction of construction sector					2.58 [2.12]							2.42 [3.70]		
GDP fraction of construction sector, 2008					0.71 [0.58]							0.61 [1.25]		
HNWS times unemployment fraction of tradable sector						0.49 [0.55]							0.34 [4.17]	
Unemployment fraction of tradable sector, 2008						-0.12 [0.15]							1.52 [1.23]	
Tradable unemployment growth, 2008 to 2010									0.29*** [0.06]					
HNWS times unemployment fraction of Non-Tradable sector														1.13*** [0.20]
Unemployment fraction of Non-Tradable sector, 2008														
Non-Tradable unemployment growth, 2008 to 2010														
N	50	50	50	50	50	50	50	50	50	50	50	50	50	50
R ²	0.41	0.63	0.45	0.41	0.44	0.43	0.6	0.22	0.41	0.24	0.24	0.23	0.25	0.47

^aThe regressions are estimated using ordinary least squares. Heteroskedasticity-robust standard errors are in brackets. ***, **, * Coefficient statistically different than zero at 1%, 5% and 10% confidence level, respectively.

Table 3 shows the effect of housing net worth shocks on non-tradable and tradable sector unemployment growth. Results show that there is a negative effect between a change in the housing net worth and non-tradable sector unemployment growth. This means that a negative housing net worth shock driven by a fall in house prices leads to a high unemployment growth from 2008 to 2010. Surprisingly, a change in the housing net worth shock shows the same effects for the tradable sector unemployment growth. There are two reasons for this outcome. Firstly, as our separation between the non-trade and the tradable sector is in some subgroups not fine-grained enough, the effect might be due to spillovers from the non-tradable to the tradable sector. Secondly there might be a direct effect between changes in house prices and tradable sector unemployment growth due to the fact that we measure trade and not global trade. Testing for linkages between the trade and the non-trade sector in regression 6 and 7, we can show that the effect on the non-tradable sector offsets the effect of the trade sector.

[The discussion of this subsection will be extended in a forthcoming working paper.]

Figure 2: Disparity of household balance sheet indicators on Non-Tradable and Tradable unemployment growth



This figure presents scatter-plots of province level non-tradable and tradable unemployment growth from 2008 to 2010 against debt-to-income ratios in 2007 and changes in housing net worth between 2007 and 2010.

In the next subsection, we repeat our tests for the second period of Spain's crisis, namely from 2010 until 2014.

Table 4: Summary Statistics (2014)

	N	mean	median	SD	10th	90th
Non-tradable unemployment growth, 2010 to 2014	50	0.259	0.26	0.189	0.087	0.367
Non-tradable unemployment growth, 2008 to 2014	50	0.68	0.675	0.208	0.473	0.892
Tradable unemployment growth, 2010 to 2014	50	0.057	0.03	0.169	-0.139	0.285
Tradable unemployment growth, 2008 to 2014	50	0.476	0.457	0.254	0.124	0.851
Housing net worth shock, 2010 to 2014	50	-2.977	-2.033	4.032	-5.002	-0.978
Housing net worth shock, 2009 to 2014	50	-1.785	-1.733	0.848	-2.744	-0.913
Housing net worth shock, 2007 to 2014	50	-1.28	-1.217	0.485	-1.933	-0.754
Household debt-to-income ratio, 2010	50	0.831	0.775	0.311	0.503	1.238
Household debt-to-income ratio, 2009	50	0.88	0.81	0.354	0.515	1.365
Household debt-to-income ratio, 2007	50	0.899	0.788	0.404	0.484	1.48
Average house purchase fraction, 2006 to 2008	50	0.795	0.826	0.118	0.608	0.929
House price growth, 2010 to 2014	50	-0.362	-0.377	0.109	-0.494	-0.233
House price growth, 2009 to 2014	50	-0.388	-0.398	0.123	-0.552	-0.226
House price growth, 2007 to 2014	50	-0.389	-0.39	0.131	-0.538	-0.233
Active person growth, 2010 to 2014	50	-0.016	-0.018	0.029	-0.052	0.027
Active person growth, 2008 to 2014	50	-0.004	-0.013	0.047	-0.063	0.065
Labor force growth, 2010 to 2014	50	-0.025	-0.03	0.019	-0.047	-0.001
Labor force growth, 2008 to 2014	50	-0.018	-0.022	0.03	-0.053	0.02
Tourism growth, 2010 to 2014	50	-0.041	-0.049	0.073	-0.171	0.045
Tourism growth, 2008 to 2014	50	-0.048	-0.064	0.105	-0.168	0.061
GDP fraction of construction sector, 2010	50	0.09	0.088	0.015	0.07	0.112
GDP fraction of construction sector, 2008	50	0.111	0.111	0.02	0.081	0.141

Table 5: Effects of debt-to-income ratios on unemployment growth between 2010 and 2014^a

	Unemployment growth, 2010-2014									
	Non-Tradable Sector					Tradable Sector				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Household debt-to-income ratio, 2009	-0.21*** [0.07]									
Household debt-to-income ratio, 2010		-0.22*** [0.08]								
Household debt-to-income ratio, 2007			-0.19*** [0.05]							
Average house purchase fraction, 2006 to 2008				-0.13 [0.25]	-0.01 [0.28]	-0.12 [0.20]	-0.13 [0.21]	-0.34 [0.20]	-0.12 [0.25]	-0.08 [0.19]
Active person growth, 2010 to 2014				0.54 [0.77]						
Labor force growth, 2010 to 2014				-2.27* [1.21]						
House price growth, 2009 to 2014					-0.03 [0.21]					
House price growth, 2010 to 2014							-0.01 [0.20]			
Debt-to-income times construction sector								11.88* [5.94]		
GDP fraction of construction sector, 2010								-12.32* [6.52]		
Debt-to-income times unemployment fraction of tradable sector								1.32* [0.69]		
Unemployment fraction of tradable sector, 2010								-1.40** [0.64]		
Tradable unemployment growth, 2010 to 2014									0.71*** [0.26]	
Debt-to-income times unemployment fraction of Non-Tradable sector										2.17 [2.89]
Unemployment fraction of Non-Tradable sector, 2010										-3.29 [3.17]
Non-Tradable unemployment growth, 2010 to 2014										0.62*** [0.09]
N	50	50	50	50	50	50	50	50	50	50
R ²	0.15	0.13	0.16	0.16	0.18	0.16	0.16	0.28	0.19	0.53

^a The regressions are estimated using ordinary least squares. Heteroskedasticity-robust standard errors are in brackets.

***, **, * Coefficient statistically different than zero at 1%, 5% and 10% confidence level, respectively.

Table 5 shows the effect of debt-to-income ratios in 2009 on non-tradable and tradable sector unemployment growth between 2010 and 2014. Interestingly, this effect turns out to be negative for non-tradable sector unemployment growth. This means that provinces with a high debt-to-income ratio face a lower increase in the non-tradable sector unemployment rates. The results hold for debt-to-income ratios in 2010 as well as in 2007. It should be noted, that changes in house prices, which have been dramatically in this episode, have no explanatory power for non-tradable sector unemployment growth (cf. regression 6 and 7)

[The discussion for this subsection will be extended in a forthcoming working paper.]

[Additional robustness checks to distinguish between possible reasons of a negative effect will be added in a forthcoming working paper.]

[An output table as well as a discussion for the effects of changes in housing net worth shock will be presented in a forthcoming working paper.]

Finally, we test for the total crisis period, namely from 2008 to 2014.

Table 6: Effects of debt-to-income ratios on unemployment growth between 2008 and 2014^a

	Unemployment growth, 2008-2014									
	Non-Tradable Sector					Tradable Sector				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Household debt-to-income ratio, 2007	-0.02 [0.07]	-0.03 [0.06]	0.05 [0.06]	-0.09 [0.05]	-0.69 [0.57]	-0.04 [0.09]	-0.06 [0.09]	-0.06 [0.10]	-0.13 [0.09]	-0.49 [0.60]
Average house purchase fraction, 2006 to 2008		-0.22 [0.29]	-0.23 [0.30]	-0.02 [0.29]	-0.60** [0.26]		-0.57 [0.36]	-0.61 [0.38]	-0.33 [0.36]	-0.77* [0.41]
Active person growth, 2008 to 2014			-1.15 [0.96]					-0.87 [0.97]		
Labor force growth, 2008 to 2014			-0.48 [1.18]					0.93 [1.43]		
House price growth, 2007 to 2014				-0.62*** [0.18]					-0.73** [0.28]	
Debt-to-Income times Construction sector					5.7 [4.55]					3.72 [5.03]
GDP fraction of construction sector, 2008					-9.1 [5.53]					-5.45 [5.92]
N	50	50	50	50	50	50	50	50	50	50
R ²	0	0.02	0.09	0.14	0.18	0	0.07	0.08	0.19	0.1

^a The regressions are estimated using ordinary least squares. Heteroskedasticity-robust standard errors are in brackets. ***, **, * Coefficient statistically different than zero at 1%, 5% and 10% confidence level, respectively.

Table 6 shows the effect of debt-to-income ratios in 2007 on non-tradable and tradable sector unemployment growth between 2008 and 2014. It shows, that the debt-to-income ratio has no effect on non-tradable unemployment growth.

[The discussion for this subsection will be extended in a forthcoming working paper.]

[An output table as well as a discussion for the effects of changes in housing net worth shock will be presented in a forthcoming working paper.]

5 CONCLUSION

We investigate in detail the situation of the Spanish provinces regarding their household balance sheets and changes in unemployment. We found that the pre-crisis mortgage debt levels had strong positive effects on changes in the provincial unemployment rates between 2008 and 2010. Changes in housing net worth confirm our results. Our findings for Spain are therefore able to confirm the result of Mian and Sufi (2014) for the US. The first part of our empirical analysis highlights the relevance of household indebtedness to unemployment.

Nevertheless, our results are not that clear as we have thought in the beginning. For the second part of Spain's crisis (2010-2014), we find opposite effects, which means that provinces with a high debt-to-income ratio face a lower increase in the non-tradable sector unemployment rates. Testing for Spain's crisis from the beginning in 2007 until 2014, household balance sheet effects do not contribute explanatory power to unemployment growth.

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